

This listing of claims will replace all prior versions, and listings of claims in the application:

**Listing of Claims:**

- 1                   1.       (Currently Amended) A mass spectrometer probe ~~that is removably~~  
2 ~~insertable into a mass spectrometer, the probe~~ comprising a substrate having a surface ~~coated~~  
3 ~~with silicon oxide~~ and a hydrogel material on the surface, wherein the hydrogel material  
4 comprises a water-insoluble and water-swellaable polymer, having absorbed at least 10 times its  
5 own weight of a liquid, that is crosslinked and is at least about 10 microns thick and further  
6 comprises binding functionalities for binding with an analyte detectable by the mass  
7 spectrometer.
- 1                   2.       (Original) The probe of claim 1 wherein the substrate is in the form of a  
2 strip or a plate.
- 1                   3.       (Previously presented) The probe of claim 1 wherein the substrate  
2 comprises an electrically conducting material.
- 1                   4.       (Original) The probe of claim 1 wherein the surface of the substrate is  
2 conditioned to adhere the hydrogel material.
- 1                   5.       (Canceled)
- 1                   6.       (Original) The probe of claim 1 wherein the surface of the substrate is  
2 rough, porous or microporous.
- 1                   7.       (Canceled)
- 1                   8.       (Currently Amended) The probe of claim 1 wherein the hydrogel material  
2 is in situ polymerized on the ~~silicon oxide coating~~ surface by depositing a solution comprising

monomers onto the glass coating, wherein the monomers are pre-functionalized to provide binding functionalities.

**9.-10.** (Canceled)

**11.** (Original) The probe of claim 1 wherein the hydrogel material is in the form of a discontinuous pattern.

**12.** (Canceled)

**13.** (Original) The probe of claim 1 wherein the hydrogel material is continuous and has one or two-dimensional gradient of one or more of the binding functionalities.

**14.** (Original) The probe of claim 1 wherein a plurality of different hydrogel materials comprising different binding functionalities are on the surface of the substrate.

**15.** (Original) The probe of claim 1 wherein the hydrogel material is a homopolymer, a copolymer, or a blended polymer.

**16.** (Original) The probe of claim 1 wherein the hydrogel material is derived from substituted acrylamide monomers, substituted acrylate monomers, or derivatives thereof.

**17.** (Original) The probe of claim 1 wherein the binding functionalities attract the analyte by salt-promoted interactions, hydrophilic interactions, eletrostatic interactions, coordinate interactions, covalent interactions, enzyme site interactions, reversible covalent interactions, nonreversible covalent interactions, glycoprotein interactions, biospecific interactions, or combinations thereof.

**18.** (Original) The probe of claim 1 wherein the binding functionalities of the hydrogel material are selected from the group consisting of a carboxyl group, a sulfonate group, a phosphate group, an ammonium group, a hydrophilic group, a hydrophobic group, a reactive

4 group, a metal chelating group, a thioether group, a biotin group, a boronate group, a dye group,  
5 a cholesterol group, and derivatives thereof.

1                   **19.**     (Previously presented) The probe of claim 18 wherein the binding  
2 functionalities comprise a carboxyl group and the hydrogel material is derived from monomers  
3 selected from the group consisting of (meth)acrylic acid, 2-carboxyethyl acrylate, N-acryloyl-  
4 aminohexanoic acid, N-carboxymethylacrylamide, 2-acrylamidoglycolic acid, and derivatives  
5 thereof.

1                   **20.**     (Previously presented) The probe of claim 18 wherein the binding  
2 functionalities comprise a sulfonate group and the hydrogel material is derived from  
3 acrylamidomethyl-propane sulfonic acid monomers or derivatives thereof.

1                   **21.**     (Previously presented) The probe of claim 18 wherein the binding  
2 functionalities comprise a phosphate group and the hydrogel material is derived from N-  
3 phosphoethyl acrylamide monomers or derivatives thereof.

1                   **22.**     (Previously presented) The probe of claim 18 wherein the binding  
2 functionalities comprise an ammonium group and the hydrogel material is derived from  
3 monomers selected from the group consisting of trimethylaminoethyl methacrylate,  
4 diethylaminoethyl methacrylate, diethylaminoethyl acrylamide, diethylaminoethyl  
5 methacrylamide, diethylaminopropyl methacrylamide, aminopropyl acrylamide, 3-  
6 (methacryloylamino)propyltrimethylammonium chloride, 2-aminoethyl methacrylate, N-(3-  
7 aminopropyl)methacrylamide, 2-(t-butylamino)ethyl methacrylate, 2-(N, N-dimethylamino)ethyl  
8 (meth)acrylate, N-(2-(N, N-dimethylamino))ethyl (meth)acrylamide, N-(3-(N, N-  
9 dimethylamino))propyl methacrylamide, 2-(meth)acryloyloxyethyltrimethylammonium chloride,  
10 3-methacryloyloxy-2-hydroxypropyltrimethylammonium chloride, (2-acryloyloxyethyl)(4-  
11 benzoylbenzyl)dimethylammonium bromide, 2-vinylpyridine, 4-vinylpyridine, vinylimidazole,  
12 and derivatives thereof.

1                   **23.**     (Previously presented) The probe of claim 18 wherein the binding  
2 functionalities comprise a hydrophilic group and the hydrogel material is derived from  
3 monomers selected from the group consisting of N-  
4 (meth)acryloyltris(hydroxymethyl)methylamine, hydroxyethyl acrylamide, hydroxypropyl  
5 methacrylamide, N-acrylamido-1-deoxysorbitol, hydroxyethyl(meth)acrylate,  
6 hydroxypropylacrylate, hydroxyphenylmethacrylate, polyethylene glycol monomethacrylate,  
7 polyethylene glycol dimethacrylate, acrylamide, glycerol mono(meth)acrylate, 2-hydroxypropyl  
8 acrylate, 4-hydroxybutyl methacrylate, 2-methacryloxyethyl glucoside, poly(ethyleneglycol)  
9 monomethyl ether monomethacrylate, vinyl 4-hydroxybutyl ether, and derivatives thereof.

1                   **24.**     (Previously presented) The probe of claim 18 wherein the binding  
2 functionalities comprise a hydrophobic group and the hydrogel material is derived from  
3 monomers selected from the group consisting of N, N-dimethyl acrylamide, N, N-diethyl  
4 (meth)acrylamide, N-methyl methacrylamide, N-ethyl methacrylamide, N-propyl acrylamide, N-  
5 butyl acrylamide, N-octyl (meth)acrylamide, N-dodecyl methacrylamide, N-octadecyl  
6 acrylamide, propyl (meth)acrylate, decyl (meth)acrylate, stearyl (meth)acrylate, octyl-  
7 triphenylmethylacrylamide, butyl-triphenylmethylacrylamide, octadecyl-  
8 triphenylmethylacrylamide, phenyl-triphenylmethylacrylamide, benzyl-  
9 triphenylmethylacrylamide, and derivatives thereof.

1                   **25.**     (Previously presented) The probe of claim 18 wherein the binding  
2 functionalities comprise a metal chelating group and the hydrogel material is derived from  
3 monomers selected from the group consisting of N-(3-N, N-biscarboxymethylamino)propyl  
4 methacrylamide, 5-methacrylamido-2-(N, N-biscarboxymethylamino)pentanoic acid, N-  
5 (acrylamidoethyl)ethylenediamine N, N', N'-triacetic acid, and derivatives thereof.

1                   **26.**     (Previously presented) The probe of claim 18 wherein the binding  
2 functionalities comprise a reactive group and the hydrogel material is derived from monomers  
3 selected from the group consisting of glycidyl acrylate, acryloyl chloride, glycidyl(meth)acrylate,

4 (meth)acryloyl chloride, N-acryloxysuccinimide, vinyl azlactone, acrylamidopropyl pyridyl  
5 disulfide, N-(acrylamidopropyl)maleimide, acrylamidodeoxy sorbitol activated with bis-  
6 epoxirane compounds, allylchloroformate, (meth)acrylic anhydride, acrolein, allylsuccinic  
7 anhydride, citraconic anhydride, allyl glycidyl ether, and derivatives thereof.

1           **27.**   (Previously presented) The probe of claim 18 wherein the binding  
2 functionalities comprise a thioether group and the hydrogel material is derived from thiophilic  
3 monomers selected from the group consisting of 2-hydroxy-3-mercaptopyridylpropyl  
4 (methacrylate), 2-(2-(3-(meth)acryloxyethoxy)ethanesulfonyl)ethylsulfanyl ethanol, and  
5 derivatives thereof.

1           **28.**   (Previously presented) The probe of claim 18 wherein the binding  
2 functionalities comprise a biotin group and the hydrogel material is derived from biotin  
3 monomers selected from the group consisting of N-biotinyl-3-(meth)acrylamidopropylamine and  
4 derivatives thereof.

1           **29.**   (Previously presented) The probe of claim 18 wherein the binding  
2 functionalities comprise a boronate group and the hydrogel material is derived from boronate  
3 monomers selected from the group consisting of N-(m-dihydroxyboryl)phenyl (meth)acrylamide  
4 and derivatives thereof.

1           **30.**   (Previously presented) The probe of claim 18 wherein the binding  
2 functionalities comprise a dye group and the hydrogel material is derived from dye monomers  
3 selected from the group consisting of N-(N'-dye coupled aminopropyl) (meth)acrylamide and  
4 derivatives thereof.

1           **31.**   (Previously presented) The probe of claim 18 wherein the binding  
2 functionalities comprise a cholesterol group and the hydrogel material is derived from  
3 cholesterol monomers selected from the group consisting of N-cholesteryl-3-  
4 (meth)acrylamidopropylamine and derivatives thereof.

1                   **32.-75** (Canceled)

1                   **76.**     (Currently Amended) The probe of claim 1 wherein the binding  
2 functionality is ~~attached to said surface via a moiety that is derived from~~ a reactive group  
3 selected from an epoxide and a carbonyldiimidazole.

1                   **77.**     (Canceled)

1                   **78.**     (Previously presented) The probe of claim 1 wherein the hydrogel  
2 material comprises cellulose or dextran.

1                   **79.**     (Previously presented) The probe of claim 1 wherein the surface is  
2 substantially smooth.

1                   **80.**     (Canceled)

1                   **81.**     (Previously presented) The probe of claim 1 wherein the substrate  
2 comprises an insulating material.

1                   **82.**     (Currently Amended) The probe of ~~any of claims 1-4, 6-11, 13-31 or 76-~~  
2 ~~81~~ wherein the surface of the substrate is conditioned with a coupling agent and the hydrogel  
3 material adheres to the surface through a covalent interaction with the coupling agent.

1                   **83.**     (Currently Amended) The probe of ~~any of claims 1-4, 6-10, 14-31 or 76-~~  
2 ~~81~~ wherein the hydrogel is attached to the surface in a plurality of discontinuous spots.

3                   **84.**     (Previously presented) The probe of claim 82 wherein the coupling agent  
4 is a silane-based agent.

1                   **85.**     (Previously presented) The probe of claim 82 wherein the hydrogel is  
2 attached to the surface in a plurality of discontinuous spots.

1                   **86.-93.** (Canceled)

1                   **94.**     (New) The probe of claim 1 wherein the hydrogel material is derived  
2 from 3-(methacryloylamino)propyltrimethylammonium chloride monomers.

1                   **95.**     (New) The probe of claim 1 wherein the hydrogel material is derived  
2 from 2-acrylamidoglycolic acid monomers.

1                   **96.**     (New) The probe of claim 1 wherein the hydrogel material is derived  
2 from N-(acrylamidoethyl)ethylenediamine N, N', N'-triacetic acid monomers.

1                   **97.**     (New) The probe of claim 18 wherein the surface of the substrate is  
2 conditioned with a silane-based coupling agent and the hydrogel material adheres to the surface  
3 through a covalent interaction with the coupling agent.

1                   **98.**     (New) The probe of any of claims 1-4, 6, 8, 11-31, 76, 78-86 and 94-97  
2 wherein the substrate comprises a metal having a thickness at least 0.5 mm.

1                   **99.**     (New) The probe of claim 98 wherein the substrate comprises a silicon  
2 oxide coating.

1                   **100.**   (New) The probe of claim 98 wherein the hydrogel material is in situ  
2 polymerized on the surface of the substrate.

1                   **101.**   (New) The probe of claim 98 wherein the substrate comprises a silicon  
2 oxide coating.

1                   **102.**   (New) The probe of claim 100 wherein the substrate comprises a silicon  
2 oxide coating.

**103.**   (New) The probe of claim 98 wherein the hydrogel material is in situ  
polymerized on the surface of the substrate.